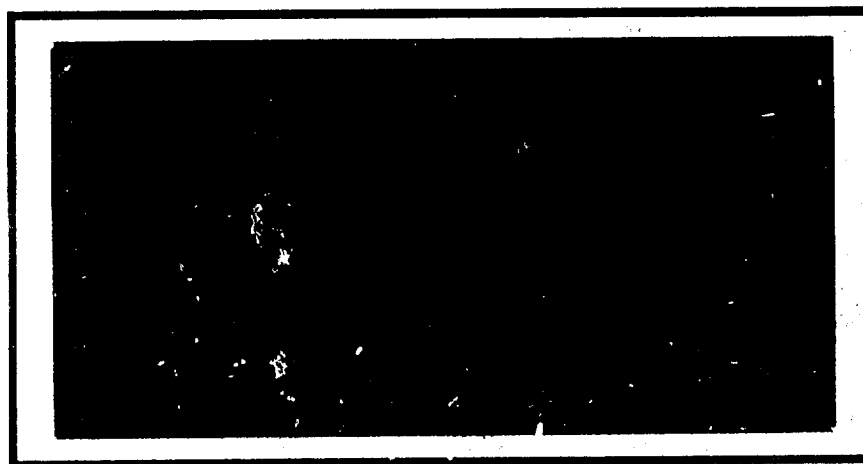


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THE STATUS OF COMPUTER ETHICS
INSTRUCTION AT AIR FORCE EDUCATIONAL
AND TRAINING INSTITUTIONS

THESIS

Jeffrey E. Nelson
First Lieutenant, USAF

AFIT/GIR/LSR/88D-9

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THE STATUS OF COMPUTER ETHICS
INSTRUCTION AT AIR FORCE EDUCATIONAL
AND TRAINING INSTITUTIONS

THESIS

Presented to the Faculty of
the School of Systems and Logistics
of the Air Force Institute of Technology
Air University
In Partial Fulfillment of the
Requirements for the Degree of
Master of Science in Information Resource Management

Jeffrey E. Nelson, B.A., M.A.

First Lieutenant, USAF

December 1988

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Abstract

This research studied the instruction being given to information management and computer science students at the Air Force Academy, Air Force Institute of Technology, and appropriate training courses offered at schools operated by the Air Training Command. The specific purpose of the study was to determine the extent to which computer ethics are being taught to information management and computer science students through this instruction. To accomplish this, instructors at the above mentioned schools were surveyed to determine what instruction in computer ethics is being given, any plans for future instruction in computer ethics, and the instructors' experience with and opinions about teaching computer ethics.

The results indicate that computer ethics are beginning to be emphasized by the education/training programs and instructors. This emphasis is gaining strength but at this time lacks a certain focus. This is probably because computer ethics have received greater attention recently, but there is still no consensus on its importance and appropriateness to a computer science curriculum. Civilian colleges and universities have been described as feeling their way in implementing instruction in computer ethics. This description is also appropriate for computer ethics instruction at Air Force institutions.

STATUS OF COMPUTER ETHICS INSTRUCTION AT AIR FORCE
EDUCATIONAL AND TRAINING INSTITUTIONS

I. Introduction

General Issue

As information systems and computer technology become more critical to and prevalent in managing organizations, unique ethical issues surrounding the application of this technology will continue to surface. Donn Parker, author of Ethical Conflicts in Computer Science and Technology, points out that "the need for special ethical considerations in the computer field arises from several unique characteristics of computers and their use" (17:1). Mason and Collins comment further on the impact these ethical issues will have on management:

Each of these has and will engender great public debate and will ultimately trigger new legislation and social mores. Neither the Information Systems executive nor the business organization can afford to be uninformed, or uncommitted as to how these issues should be dealt with in both the public and private arena (16:4).

At a time when the use of information systems and computer technology are creating such complex concerns, managers of information systems (MIS) and computer science professionals lack a firm ethical base for understanding these issues. Donn Parker explains:

Computer science and technology have been in existence for only 30 years. It is little wonder, therefore, that serious problems arise in developing ethical concepts and practices in such a comparatively short period of time (17:2).

Information systems and computer technology are proliferating throughout the Air Force. The Air Force has committed itself to computer science research and to the implementation of information systems. The Air Force has hired and trained many MIS and computer science professionals to support this commitment.

This thesis research will provide a partial answer to the management question of how the Air Force is ensuring that its MIS and computer science professionals know the ethical considerations involved in the use of information and computer technology.

Definitions

The following definitions explain the key terms used in this thesis:

1. Computer Ethics: "The study of the general nature of morals and of the specific moral choices to be made by the individual in his relationship with others (4/450)" as these morals and choices pertain to the use of information systems and computer technology.

2. Air Force MIS and computer science professionals: Air Force officers who are serving in career fields that specifically entail managing, designing, modifying, or

creating information management or computer systems. The focus of MIS professionals is on the use of data and information handled by the systems. Computer science professionals focus on the actual hardware and software that make up the computer system.

Terms applying directly to the population studied in this thesis are defined in Chapter III, "Methodology."

Specific Problem

There are many ways in which MIS and computer science professionals could become aware of ethical issues surrounding information systems and computer technology. Much of the literature has focused on university curricula and instruction as an excellent way of teaching computer ethics to MIS and computer science professionals (21:93).

The Air Force could take advantage of its role in university curricula and other instructional training to teach computer ethics to its MIS and computer science professionals as mentioned in the literature. The Air Force operates institutions of higher education which offer degrees in information resource management, computer science, and computer systems. It also trains Air Force MIS and computer science professionals through courses offered by schools in the Air Training Command. All of these provide the Air Force a unique opportunity to teach its own MIS and computer science professionals about computer ethics.

This thesis looks at university level MIS and computer science curricula and training courses offered by Air Training Command schools within the Air Force. The specific research objective is to determine to what extent computer ethics are being taught to MIS and computer science students at educational/training institutions operated by the Air Force.

Investigative Questions

The following investigative questions were designed to meet the research objective:

1. What are the specific courses of instruction at Air Force educational/training institutions devoted to computer ethics?
2. Is instruction in computer ethics, at Air Force educational/training institutions, incorporated into MIS and computer science courses that are not devoted to computer ethics? If so, how?
3. What are the future plans for teaching computer ethics in computer science and information resource courses at Air Force educational/training institutions?
4. How much knowledge and experience do instructors at Air Force educational/training institutions have in teaching computer ethics?
5. What opinions do these instructors have about teaching computer ethics?

Justification

Complex ethical issues will continue to affect the Air Force as it depends more and more upon information systems and computer technology. In this environment, Air Force MIS and computer science professionals must know how to deal with these human issues.

This thesis research will tell the Air Force whether it is teaching its MIS and computer science professionals about computer ethics through its educational and training institutions, and if it is, how well.

Scope

Ethics, because ethical standards are relative, can be a very difficult concept to isolate and define. It is important to keep in mind, especially during the initial stages of this thesis, that this research does not try to determine what the proper ethical standards in the MIS and computer science profession should be but reports the status of actual classroom instruction about ethical considerations in computer science curricula.

Although the management question calls for broader research, this thesis investigates only one method of conveying computer ethics: formal classroom instruction at educational/training institutions operated by the Air Force.

II. Background and Literature Review

Advances in information systems and computer technology are occurring at a rapid pace. Each discovery of a better system design, engineering technique, or communication capability serves as a catalyst for further and even greater advancements. The miniaturization of computer components has resulted in the proliferation of information systems and computer technology, and has made it possible to store increasingly massive amounts of information in more places, to be shared by more users, and to be transmitted at greater speeds than ever before. At the same time, artificial intelligence expands the power of computers and gives computer professionals more responsibility than ever thought possible by simulating human intelligence. Computer technology is now used for everything from medical diagnosis to the operation of nuclear power plants. Alvin Toffler describes the situation in his book The Third Wave:

During the 1970's, however, fact outraced fiction.... As miniaturization advanced with lightning rapidity, as computer capacity soared and prices per function plunged, small, cheap, powerful mini-computers began to sprout every-where. The 'brainpower' of the computer was no longer concentrated at a single point; it was 'distributed.'

This dispersion of computer intelligence is now moving at high speed (20:169).

Despite all the benefits realized by the rapid progress made in information systems and computer technology, there is a concern that the progress made on the technological front is not matched by a developing ethical base among the

professionals who manage and operate computer systems.

Robert Campbell, a computer security consultant, testified before Congress that the computer industry

has failed to develop an essential ethical base amongst its purveyors and practitioners. The technology has now moved into the public domain in the form of personal or home computing without the essential ethical base migrating with it (7:7).

Writing in the Journal of Systems Management, Dr. Jack Bologna comments that society "expects a lot more than [the computer science profession] can provide, given the newness of our field and our general confusion over our own ethical responsibilities" (8:29). J.J. Bloombecker, Director of the National Center for Computer Crime Data says "there is a conspicuous silence on the topic of computer ethics. Our leaders seem quite involved in computing, but not in the consideration of its ethical issues" (7:7).

Defining Computer Ethics

Before we can begin the study of computer ethics, we must define the term. Most of the literature gives only a cursory view of the term's meaning. Apparently most writers assume that the term is fairly well understood. Professor Hanson of the School of Business at Stanford University defines computer ethics as "appropriate behavior that takes into account the impact of an individual's actions on all the parties involved in a particular situation and balances the various concerns, rights, and opportunities" (14:66). Gary Abshire of the IBM Corporation defines it as "the discipline

for studying moral value judgments and the basis for those judgments and for understanding situations, anticipating consequences, and making correct decisions" (1:10). In a paper presented to the 17th Technical Symposium on Computer Science Education, Janet Cook of the University of Illinois says that computer ethics "involve understanding the effects of actions, and evaluating them according to a standard of right and wrong" (11:90). Gary Abshire also defines what he calls "ethical obligations."

These ethical obligations are the just and fair dealings that [a person] should have with other people, dealings that one feels bound to do, or to refrain from doing, because of the law, their own morality, or some other ethical reason (1:11).

The common element in all definitions is the concept of considering the consequences of the action and the impact it will have on others.

Another, and more practical, technique for defining computer ethics is to identify the ethical issues which involve information systems and computer technology. For example: "The ethical issues involved are many and varied; however, it is helpful to focus on just four. These four [are privacy, access, property, and accuracy]" (16:5). The author has not actually defined computer ethics but has identified the areas in which other people will be affected because of the consequences of using computer and information technology.

The Need for Computer Ethics

The foregoing discussion illustrates that the MIS and computer science profession does not yet have an established ethical base because the field is so young in comparison to established disciplines like medicine and law. The older professions have had a long tradition of professional ethics handed down from professor to student at universities and from practitioner to practitioner through professional organizations such as the American Medical Association and the American Bar Association. A similar tradition needs to be developed as soon as possible within the MIS and computer science profession (17:2).

The professional literature frequently refers to the serious nature of ethical issues and the need for MIS and computer science professionals to learn about them. The ethical problems are only going to get more complex and demanding. Dr Joseph Sardinias explains:

Over the next 10 to 20 years, the development of computer technology and usage will raise many serious issues of ethics and social policy. Whether these issues are resolved to our benefit or to our harm depends not so much on the potential of computers as on our attitude toward computers and our use of them (19:15).

Some professionals blame the lack of ethical sensitivity as the cause of nearly all abuses of information systems and computer technology. They maintain "that at the root of most of the problems that are caused by the improper use of computers is an inept or omitted ethical decision" (1:11).

More than one author believes that the lack of computer ethics shares the blame for causing computer crime. "[T]he lack of ethics is the root of white-collar crime in the U.S." (14:66).

Computer criminals find ample nourishment in the present unethical environment; illegal acts can be justified to the conscience, and others can be kept mute by threatening to expose their "skeletons." As the criminals look about themselves, their ranks are swelled daily by fellow employees, managers, owners of businesses, bureaucrats, politicians, juveniles, and others armed with computer technology (5:8).

Corporations and organizations also sense the impact of information technology upon ethics, laws, and corporate cultures. They are being forced to adapt to a rapidly changing environment.

For one thing, the ever-increasing dependence on computers - for everything from sophisticated forecasting to routine operations - heightens the vulnerability of corporations to computer abuse (9:112).

"When so great a wave of change crashes into society, traditional management, values, cultures, organizational procedures, and organizational forms become obsolete" (18:10).

This rapidly changing environment points out a problem with which corporations and other organizations have to deal. At this time, knowledge and understanding of complex ethical and social issues surrounding information systems and computer technology are needed. However, those in positions of responsibility lack the ethical understanding required to handle many of the non-technical decisions involving

information systems and computer technology. Donn Parker points out that "though computer technologists are garnering positions of great corporate trust, they belong to a profession that lacks a tradition and responsibility of ethical standards" (7:7). Management has voiced its concern about MIS and computer science employees to Janet Cook. She says that employers complain "that C.S. and C.I.S. graduates don't have a clear conception of what constitutes ethical professional behavior" (11:89).

In addition, there is a potential negative impact on the computer science and MIS professions if we do not develop an ethical base. Students of ethical problems within the computer science and MIS professions point out that if we fail to develop an ethical base, and if society believes the profession is not acting correctly, then society will take steps to control the profession. These sentiments are expressed by Murray Laver.

Given that our use of computers will continue to develop, and recognizing that the forms of social control considered...are purely negative...We could attempt to steer the course of development in directions that we expect to be socially and economically beneficial (15:118).

There is a similar concern in the artificial intelligence community.

With the great amount of attention now being paid by the media to artificial intelligence, it would be naive, shortsighted, and even self-deceptive to think that there will not be public interest in scrutinizing, monitoring, regulating, and even constraining our efforts. What we do can affect people's lives as they understand them. People are going to ask not only what we are doing but also whether it should be done. Some

might feel we are meddling in areas best left alone. We should be prepared to participate in open discussion and debate on such ethical issues (10:64).

Jay Bloombecker illustrates.

Would a "computer environmentalism" similar to other environmental movements be preferable? How many users would like to see the power of the Sierra Club, Friends of the Earth, and other such organizations focused on attempting to "keep the computer community in line"?

Such a movement is inevitable, I predict, unless the computer industry clearly indicates its own environmental awareness . . . (6:13).

These authors share a common concern. They argue that a failure of ethics can lead to negative consequences on crime, organizational management, and the computer science and information management professions themselves. The authors consistently point out that if more attention is not focused on this problem, it will get worse. A solution must be found.

Ethics as a Solution

Several articles call for methods to establish and promote ethical standards within organizations, business and the computer science and MIS professions. Some recommend simply encouraging members of the organization to pay more attention to situations which require ethical awareness.

Encourage them to take the time, individually and as a group, to evaluate the rightness of their intentions and the goodness of the possible and realized consequences of their actions, using their conscience and sense of values as guides (1:11).

Other authors describe the lack of computer ethics as very significant and call for a very serious look at what needs to be accomplished in this area.

Our moral imperative is clear. We must insure that information technology, and the information it handles, are used to enhance the dignity of mankind. To achieve these goals we must formulate a new social contract, one that insures everyone the right to fulfill his or her own human potential.

This is a tall order; but it is one that we in the MIS community should address. We must assume some responsibility for the social contract that emerges from the systems that we design and implement (16:11).

Some authors address the potential for computer ethics to help combat the proliferation of computer crime. One writer maintains that the most common computer abuses: hacking [trespassing into other computer systems], piracy, and invasion of privacy, are 'too pervasive, too ambiguous, too low-cost, and too complex to be dealt with through the criminal law' (7:6). The point is, that perhaps the widespread adoption of computer ethics would accomplish what has proven impractical for the law.

Many articles argue the importance of codes of ethics and recommend their adoption and use as well as the institution of awareness programs and standards of conduct throughout the computer world. One argues that

Because the technology is so accessible, the opportunities for abuses abound. One way to alleviate or at least reduce the potential for abuse is to hire well-motivated professionals. Another is through legal and ethical structures (13:38).

Again,

Ethical ground rules are the heart of organizational culture. Ethics is the fulcrum in culture for producing change. All cultural learning reflects someone's original values, their sense of what 'ought' to be, as distinct from what is. A set of values that become embodied in an ideology or organizational philosophy can serve as a guide for managing uncertainty of intrinsically complex events such as new technologies (18:16).

Developing a code of ethics for an organization is often viewed as a first solution. 'Codes of ethics in the era of the computer are not a luxury; rather, they are a necessity' (5:10). An 'approach to control of abuse is through codes of behavior. Here there are three areas in which to work--the organization itself, professional societies, or the larger legal entities' (13:39).

Support for ethics and establishment of such codes can prove important in restraining the potential unethical conduct of some members of your organization. Professionals want to present the best image possible to their peers; it would serve them ill if they were viewed as unethical by fellow profession-als (5:14).

Teaching Computer Ethics

As described above, the computer science and MIS professions, historically do not have a firm ethical foundation. This absence contributes to various problems within the profession, organizations, and society itself. Many authors believe that the development of ethical standards will provide at least a partial solution to these problems. All of this has focused attention on the formal education of computer science and information management professionals.

Invariably, the literature supports more emphasis on computer ethics in computer science and MIS curriculum. Robert Aiken of the University of Tennessee believes that computer ethics need to be taught immediately.

Our society is becoming ever more dependent on computers and information technology. We need to ensure that students graduating from our programs realize their own responsibility with respect to the multi-faceted nature of the problems they will be asked to tackle. There is a great need to sensitize as many people as possible (especially 'information specialists') to the complex issues they will be facing (3:11).

Rein Turn of the California State University agrees.

It is becoming increasingly important for the computer professionals to be able to analyze societal impacts of proposed applications and to know how to minimize the potential harms. This, and other aspects of computer use, raise important ethical and legal questions which computer professionals must understand. One approach is to conduct educational programs aimed at practicing professionals and, in particular, at the students in computer science (21: 14).

Courses presently taught at various colleges focus on computer ethics. The literature contains frequent articles, by the professors of these courses, that explain the syllabi, reading materials, or method of instruction. Robert Aiken's article in the September 1983 SIGCSE Bulletin is typical (1:8-11).

Despite these articles that communicate the details of a few actual courses, generally, the literature is critical of the present status of the teaching of computer ethics at the nation's colleges and universities. An article in The Chronicle of Higher Education is particularly revealing.

The failure of many colleges and universities to teach their computer-science students about the social and ethical responsibilities they will face as professional computer programmers is an oversight with potentially catastrophic consequences for society, according to several computer-science educators.

At a time when computers are being used for tasks that include medical diagnoses, air-traffic control, and the monitoring of nuclear power plants, many institutions have concentrated on technical training at the expense of instruction in computer ethics, the educators say (12:A15).

Similar Survey Techniques

No previous survey of faculty regarding the teaching of computer ethics seems to have been done. The literature does show a similar research conducted by the Ethics Resource Center of Washington D.C. in the early 1980's. That research described a survey of 134 deans of graduate business schools. The deans were asked to respond to questions about teaching business ethics. 'The study's findings demonstrated that...the business schools have neglected the study of ethics' (5:12).

Another survey was conducted at Bentley College, Waltham, Massachusetts in 1984 (2:93). This survey asked students, not faculty, to respond. Also, the questions centered around computer use and academic honesty instead of the actual teaching of computer ethics.

A self-assessment procedure dealing with ethics in computing was initiated in 1982 in the publication Communications of the ACM (22:181). The self-assessment used computer scenarios and asked readers to respond to the ethicality of each issue in the scenarios. The publication

then asked the respondents to mail in their analysis forms to be compiled. Again this survey reported how people felt about certain ethical situations involving information systems and computer technology and not the actual teaching of computer ethics.

III. METHODOLOGY

Justification

A survey was designed to answer the investigative questions and fulfill the specific research objective. This technique for data collection is best suited to the specific research objective of this thesis. It provides the most efficient and concise method for collecting data from a large, geographically separated population. The questions asked on the survey are not detailed and do not require an interview methodology. The survey method allowed members of the population to complete the questions at their convenience with minimum coordination with the researcher.

In this instance, the population surveyed was relatively small and concentrated, and a large portion was colocated at the Air Force Institute of Technology with the researcher. Because of these characteristics, the researcher was able to monitor and control the response more effectively.

Instrument

No known survey instrument exists to gather the data needed to answer the research question so a survey was designed.

The survey was introduced with a brief description of the general issue to give the respondents a common reference with the researcher and to familiarize them with the research objective. The survey consisted of twenty-four

questions specifically designed to answer the investigative questions. Most of the questions in the survey were designed to help answer the investigative questions. The first six questions ask for demographic data consisting of age, rank, sex, education level, years experience, and where the respondent is currently teaching. Questions 7 through 20 ask for simple 'yes' or 'no' responses. Four of these also ask for brief, additional information such as the title of a course or the amount of time devoted to ethical issues in each class. Responses to these questions yielded data about courses are taught, ethical issues discussed in the course, experience of the instructors with teaching computer ethics, and a few opinions instructors have about the teaching of computer ethics. The final four questions use a five-point Likert scale to further measure the strength of specific opinions that instructors have about the teaching of computer ethics.

To test the validity of the instrument, professionals in the Department of Communications and the Department of Systems of Acquisition Management reviewed the survey. The survey was approved by the Air Force Military Personnel Center at Randolph Air Force Base, Texas.

Population

The population for the research are instructors in courses in information resources management and computer science at schools operated by the United States Air Force

to educate/train its officers. This population was selected because of their direct involvement with and knowledge of the research issue: determining the extent to which computer ethics is being taught to MIS and computer science students at educational institutions operated by the Air Force.

Schools operated by the United States Air Force for the purpose of educating its officers are:

1. Air Force Institute of Technology School of Systems and Logistics (AFIT/LS).
2. Air Force Institute of Technology School of Engineering (AFIT/EN).
3. Air Force Academy.
4. Schools in officer career field instruction offered by the Air Training Command (ATC) at Keesler Air Force Base, Mississippi.

Instructors in information resources management and computer science courses are:

1. At AFIT/LS--instructors assigned to the Department of Systems Acquisition Management who teach the Information Resources Program.
2. At AFIT/EN--instructors assigned to the Department of Electrical and Computer Engineering.
3. At the Air Force Academy--instructors who are assigned to the Department of Computer Science.
4. For the ATC School--instructors who teach courses identified by the Formal Schools Catalog (AFR 50-26)

for training officers in the computer science career field. Two courses were identified: Computer Systems Operations and Computer Systems Maintenance. The Computer Systems Operations course is the basic course in the computer science curricula while the Computer Systems Maintenance course fulfills the need for an advanced course in the curricula.

Data Collection

Once the survey was designed, validated, and approved, it was mailed to those teaching at the Air Force Academy and those teaching courses offered by ATC. The survey was personally delivered to those teaching at both AFIT/LS and AFIT/EN. Prior to mailing and delivering the survey, the researcher contacted members of the departments at AFIT and the Academy and the course branches at ATC training centers to inform them of the purpose and arrival of the survey and to help ensure their cooperation.

Twenty-one surveys were sent to the Air Force Academy, 38 to the instructors associated with the ATC Computer Systems Operations Course and 25 to the instructors associated with the ATC Computer Systems Maintenance Course, 35 to AFIT/EN, and 5 to AFIT/LS.

The surveys from the Academy and ATC training centers were returned by mail. The researcher personally picked up the surveys from respondents at AFIT/LS and AFIT/EN.

The data collected from the completed survey was primarily at the nominal and ordinal levels. However, some questions were designed to give data at the interval level. These questions used a simple five-point Likert scale to measure the strength of instructors' opinions.

Data Analysis

The analysis of the data collected from the survey is descriptive. Neither the research nor the survey is designed for statistical inferences. Rather, it provides a comprehensive report of the present status of teaching computer ethics at the Air Force educational institutions defined in the population. The analysis of courses, teaching techniques, and instructor plans and opinions should yield an accurate description of what is actually taking place in Air Force computer science/information resources education for officers in regards to computer ethics.

The data in most instances will be reported in percentages and numbers reflecting the responses to each question. Frequency distributions will be shown mainly in the tabular form.

A summary of the data achieved by using descriptive statistics will reveal general patterns of the data and highlight some of the unique characteristics.

IV. Findings and Analysis

Introduction

This chapter analyzes the responses to the survey instrument. There were a total of 75 respondents who completed the survey. The frequency distributions covered in the following analysis are strictly descriptive. No statistical significance is implied nor are inferential methods employed for these distributions.

This analysis consists of four parts paralleling the parts of the survey instrument. Part one contains responses to survey questions regarding respondent demographics. The second part describes the responses to questions dealing with the actual teaching of computer ethics. The third part covers the analysis of responses to questions regarding the experience of instructors with computer ethics. To conclude, the final part covers responses to questions which express the respondents opinions about teaching computer ethics.

Respondent Demographics

Questions 1 to 6 gathered demographic data. The survey asked about six demographic features: age, rank, sex, educational level, years in present job, and instructor's present teaching location. The frequency breakouts and general discussion for each demographic variable follow.

Question 1: Age. Survey respondents ranged in age from about 25 years to over 41 years. The frequency distribution of respondent ages is as shown in Table 1.

Table 1. Age of Respondents

<u>Age</u>	<u>No. of Responses</u>	<u>Percentage</u>
20 - 25	4	5.3
26 - 30	14	18.7
31 - 35	24	32.0
36 - 40	18	24.0
41 or above	<u>15</u>	<u>20.0</u>
	75	100

Question 2: Rank. The largest number of respondents are Air Force captains as Table 2 indicates. The rank of the respondents, however, varies considerably: those in the military range from the enlisted ranks to lieutenant colonel and civilians range from below GS-8 to GS-11.

Table 2. Rank of Respondents

<u>Rank</u>	<u>No. of Responses</u>	<u>Percentage</u>
Second Lieutenant	1	1.3
First Lieutenant	2	2.7
Captain	35	46.7
Major	18	24.0
Lt Colonel	5	6.7
Up to GS-8	1	1.3
GS-9 to GS-11	4	5.3
*Other	<u>9</u>	<u>12.0</u>
	75	100.0

*Most of the respondents who indicated their rank was something other than the categories offered in the survey are enlisted.

Question 3: Sex. The respondents were overwhelmingly (90.7%) male. The frequency distribution for sex of respondents is given in Table 3.

Table 3. Sex of Respondents

<u>Sex</u>	<u>No. of Responses</u>	<u>Percentage</u>
Female	7	9.3
Male	<u>68</u>	<u>90.7</u>
	75	100.0

Question 4: Educational Level. Faculty members generally have a high educational level. Over two-thirds of the respondents hold at least a Master's degree. Table 4 gives the levels of education of the respondents.

Table 4. Educational Level of Respondents

<u>Education Level</u>	<u>No. of Responses</u>	<u>Percentage</u>
Bachelor's degree	10	13.3
Bachelor's degree plus	7	9.3
Master's degree	18	24.0
Master's degree plus	12	16.0
Doctoral degree	<u>22</u>	<u>29.3</u>
	*69	91.9

*Six respondents (8.0 %) failed to indicate their educational level. Having less than a bachelor's degree was not an option included on the survey. These six were from an ATC school and probably represent enlisted respondents who are not required to have a bachelor's degree.

Question 5: Years in Present Job. Table 5 shows that few of the respondents have been in their present jobs for more than 4 years. Only 13.3% have been at their present

job for more than 4 years but nearly twice that (25.3%) have been there for less than 1 year. The responses reflect the frequent reassignment of personnel that is typical in the Air Force.

Table 5. Years in Present Job

<u>Years in Present Job</u>	<u>No. of Responses</u>	<u>Percentage</u>
Less than 1 Year	19	25.3
1 Year but less than 2	9	12.0
2 Years but less than 3	14	18.7
3 Years but less than 4	23	30.7
More than 4 Years	<u>10</u>	<u>13.3</u>
	75	100.0

Question 6: Teaching Location. When they completed the survey, respondents were teaching at the Air Force Academy, the Air Force Institute of Technology, or at the ATC school. Table 6 reveals the specific frequency breakdown.

Table 6. Where Respondents are Teaching

<u>Where Teaching</u>	<u>Responses</u>	<u>Percentage</u>
Air Force Academy	13	17.3
Air Force Institute of Technology	28	37.3
ATC School	<u>34</u>	<u>45.4</u>
	75	100.0

Teaching Computer Ethics

Questions 7 - 13 of the survey were designed to gather descriptive data on the actual courses and topics taught and

teaching techniques used to deal with computer ethics. The frequency distributions and a general discussion of data provided from responses to these questions follow.

Question 7. Table 7 shows that only one respondent indicated, by answering question 7 "yes," that he teaches a "course devoted to the topic of computer ethics."

Table 7. Teach a Course Devoted to Computer Ethics

	<u>Responses</u>	<u>Percentage</u>
YES	1	1.3
NO	<u>70</u>	<u>93.4</u>
	*71	94.7

*Four respondents (5.3%) did not answer question 7.

Questions 8 and 9. Only respondents who answered question 7 "yes," indicating that they "teach a course devoted to the topic of computer ethics," were asked to answer the narrative, open-ended questions 8 and 9.

The one respondent who answered questions 8 and 9 teaches at the ATC school. In answering question 8, he stated that the title of the course is Computer Security. His answer to question 9, explains he began teaching the course in October 1987 and that he experienced no obstacles in beginning and organizing the course; furthermore, he plans to continue teaching the course.

For clarity, it should be pointed out that Computer Security is not a complete course in itself. It is a smaller unit of a larger course, one of many separate

'topic' modules that make up either the ATC Computer Systems Operations Course and the Computer Systems Maintenance Course.

The respondent also indicated that the ethical principles taught in the class surround the issues of fraud, waste, and abuse of Air Force computer and information systems resources. The respondent uses as a text the Air Force 'fraud, waste, and abuse' regulation.

Because of the concentration on fraud, waste, and abuse issues this module probably should not be considered strictly a 'computer ethics' module. Certainly some fraud, waste, and abuse issues are also considered computer ethics issues. However, this module treats computer and information resources like any other government or corporate owned resource. It doesn't stress these ethical issue that exists because of the unique and sophisticated nature of computer and information technology.

In addition to the module described above, there is another module at the ATC school is devoted even more specifically to the topic of computer ethics. However, the instructor in that module indicated in question 7 that he did not teach an entire course devoted to computer ethics. He stated that his is only 1 of 33 modules that make up the entire course.

The module addresses many of the broad ethical issues that are characteristic of the degree programs offered at AFIT and the Academy; privacy, software ownership,

intellectual property, right of access to data, responsibility for accuracy of data, and the impact of computer and information technology upon society.

Question 10. This is a multiple part question designed to gather data on ways computer ethics are taught in classes other than those specifically devoted to the subject. The one respondent who answered questions 8 and 9 was directed by the survey not to answer this question. Percentages for this question are based on 74 respondents.

10a. Over 83 percent of respondents (those who don't teach a course devoted to computer ethics) stated that they do not specifically devote any portion of any of their other courses to learning about computer ethics (Tables 8 and 8-1).

Table 8. Courses With Portions Specifically Devoted to Computer Ethics

	<u>No. of Responses</u>	<u>Percentage</u>
NO	62	83.7
YES	<u>7</u>	<u>9.5</u>
	*69	93.2

*Five respondents (6.8%) did not answer any portion of question 10.

Table 8-1 indicates the percentages of answers to this question by teaching location. The table shows that a much larger percentage of instructors at the Air Force Academy devote a portion of their classes specifically to computer ethics.

Table 8-1. Percentages by Teaching Location

	<u>NO</u>	<u>YES</u>
Academy	30.1	30.1
AFIT	96.4	3.6
ATC	94.0	5.9

10b. This question asked instructors to indicate whether they spend a portion of their lecture time on the topic of computer ethics. Tables 9 and 9-1 reflect the frequency distribution.

Table 9. Any Portion of Lecture Spent on Computer Ethics

	<u>No. of Responses</u>	<u>Percentage</u>
NO	50	67.6
YES	<u>19</u>	<u>25.6</u>
	*69	93.2

*Five respondents (6.8%) did not answer any portion of question 10.

The percentage of responses by teaching location is shown in Table 9-1. Again, a much larger percentage of instructors from the Air Force Academy responded that they spend some portion of their lectures talking about computer ethics.

Table 9-1. Percentages by Teaching Location

	<u>NO</u>	<u>YES</u>
Academy	7.7	53.8
AFIT	82.1	17.9
ATC	78.8	21.2

10c. This question provides the number of instructors who discuss the topic of computer ethics with students in their classes. Tables 10 and 10-1 contain the frequency distribution of responses to this question.

Question 10b asked instructors if they "spend a portion of [their] lecture time and material on the topic of computer ethics?" Question 10c asked instructors if "the topic of computer ethics or any specific ethical situation is ever discussed with or among the students in your classes?" The two questions were designed to differentiate between planned lecture time and the spontaneous discussion that students initiate. Responses suggest that this distinction was not perfectly clear. This lack of distinction may explain why those who said "yes" in question 10b also said "yes" in question 10c.

Table 10. Any Discussion of Computer Ethics
in Class

	<u>No. of Responses</u>	<u>Percentage</u>
NO	41	55.4
YES	<u>28</u>	<u>37.8</u>
	*69	93.2

*Five respondents (6.8%) did not answer any portion of question 10.

Table 10-1 gives the percentages of responses to question 10c by teaching location. The percentage of instructors at the Air Force Academy who discuss ethical issues with their students is again the highest. However,

the percentages for the Air Force Institute of Technology and the Air Training Command school are much higher than for lecture time or a specific portion of their class devoted to computer ethics.

Table 10.1 Percentages by Teaching Location

	<u>NO</u>	<u>YES</u>
Academy	15.4	46.1
AFIT	60.7	39.3
ATC	66.6	33.3

10d. This question asked about the inclusion of books or articles dealing with computer ethics in class bibliographies, reading lists, or other class handouts. Table 11 shows that most instructors do not include books or articles dealing with computer ethics in handouts.

Table 11. Articles about Computer Ethics Included on Bibliographies or Reading Lists

	<u>No. of Responses</u>	<u>Percentage</u>
NO	63	85.1
YES	<u>6</u>	<u>8.1</u>
	69	93.2

*Five respondents (6.8%) did not answer any portion of question 10.

Question 11. This question allows those instructors who answered 'yes' to any part of question 10, to explain the issues or topics that they cover in their classes. It calls for an open-ended, narrative answer. Twenty-six

instructors answered this question. The entire list of narrative responses/topics is provided in Appendix B.

The narrative comments to question 11 from instructors at the ATC school indicate a heavy emphasis on two issues: fraud, waste, and abuse and pirating software. Seventy-five percent of the respondents from the ATC school mentioned these as ethical issues that are brought up in their classes.

Probably because of the training nature of the courses offered at the ATC school, some instructors mentioned that attention is given to the students' relationship to the government or the Air Force. Air Force regulations covering the Privacy and Freedom of Information Acts and the government's ownership of application software were also discussed in the classes.

Instructors at AFIT and the Academy indicate that the ethical issues surrounding the ownership and copyrights of software are brought up most in their classes. Half of the instructors from AFIT and the Academy say the use of shareware and software piracy are discussed in their classes. In contrast to the instructors at the ATC school, the instructors at AFIT and the Academy seldom bring up the issues of fraud, waste and abuse.

There is a much broader range of issues discussed in the AFIT and Academy classes than in the ATC courses. No doubt, this reflects the difference between the degree programs at AFIT and the Academy and the training offered at

the ATC school. There is probably much more time to discuss these issues in a lengthy degree program than there is in the brief training period provided by the ATC school. The comments from AFIT and the Academy reveal that larger ethical issues are being discussed in classes. These larger issues include the responsibility for accuracy of data, right of access to data, software ownership, ethical performance evaluations, and impacts of computer and information technology on society.

Question 12. This question provided data on instructors' plans for teaching computer ethics in the future. Again, the respondent who answered question 7 "yes" was directed not to answer question 12. Percentages for this question are based on 74 respondents. It is a two-part question and the frequency distributions are below.

12a. This question asked the respondents if they had any plans to teach a course on computer ethics in the future. Table 12 indicate the frequency distribution.

Table 12. Plans to Teach Course Devoted to Computer Ethics

	<u>No. of Responses</u>	<u>Percentage</u>
NO	64	86.4
YES	<u>2</u>	<u>2.7</u>
	*68	89.1

*Eight respondents (10.9%) did not answer question 12a.

The two respondents who stated that they had plans to teach a course on computer ethics are located at the Air Force Institute of Technology. This course is AMGT 553 entitled Software Project Management. This is a graduate level course offered to students majoring in computer science and computer engineering.

The course was originally worth 3 credit hours, but will be expanded in September 1988 to a 4 credit hour course. The content of the course was specifically expanded to include the issue of software engineering ethics.

12b. Respondents were asked to indicate if they had any plans to incorporate the topic of computer ethics into any of their other courses not devoted to the topic of computer ethics. Table 13 and 13-1 reflect the responses.

Table 13. Incorporating Computer Ethics
Into Other Courses

	<u>No. of Responses</u>	<u>Percentage</u>
NO	55	74.3
YES	<u>10</u>	<u>13.5</u>
	*65	87.8

*Nine respondents (12.2%) did not answer question 12b.

Table 13-1 gives the percentages for this question by teaching location. The percentage of instructors who plan to incorporate the topic of computer ethics into their courses is largest at the Air Force Institute of Technology.

Table 13-1. Percentages by Teaching Location

	<u>NO</u>	<u>YES</u>
Academy	53.8	7.7
AFIT	67.9	28.6
ATC	85.3	3.0

A lower percentage of instructors said "yes" at the Air Force Academy. This possibly reflects the higher percentage (Tables 8-1 and 9-1) of instructors who already incorporate the topic into their classes. The low percentage at the Air Training Command school is possibly the result of the school's highly structured curriculum (modules) and techniques. Also, ATC already has a complete module in the course devoted to computer ethics.

Question 13. This question asked instructors if they tried to introduce their students to any of the professional codes of ethics and conduct that have been developed for the MIS and computer science professional. Table 14 contains the frequency distribution for the responses to this question.

Table 14. Acquaint Student with Code of Ethics and Conduct

	<u>No. of Responses</u>	<u>Percentage</u>
NO	64	86.4
YES	<u>5</u>	<u>6.7</u>
	*69	93.1

*Six respondents did not answer question 13.

Experience of Instructor with Computer Ethics

Questions 14 - 18 were designed to obtain data about the respondents' experience with ethical situations and issues as well as to determine how the instructors themselves had learned about computer ethics. The frequency distributions and general discussion of the data gathered from responses to these questions follow.

Question 14. The respondents were asked if they had ever seen or experienced ethical problems involving computer or information technology. Almost 75 percent of the instructors have either personally experienced or have seen others experience problems regarding the ethical use of computer or information technology. Tables 15 and 15-1 show the number of responses to this question.

Table 15. Are Personally Aware of Ethical Problems
Involving Computers or Information Technology

	<u>No. of Responses</u>	<u>Percentage</u>
NO	19	25.3
YES	<u>55</u>	<u>73.4</u>
	*74	98.7

*One respondent (1.3%) did not answer question 14.

Table 15-1 contains the percentages for question 14 by teaching location. The percentages at the Air Force Academy and the Air Force Institute of Technology are much higher than those at the Air Training Command school. It is important to stress that the question did not ask the

respondents if they had seen or experienced ethical problems specifically at their teaching location. The question asked 'had you ever seen or experienced ethical problems involving computer or information technology?'

Table 15-1. Percentages by Teaching Location

	<u>NO</u>	<u>YES</u>
Academy	0	100.0
AFIT	17.9	82.1
ATC	41.2	55.9

The responses to questions 10a - 10d and question 14 were cross referenced to see if there is any descriptive relationship between an instructor's personal experience with ethical problems (Question 14) and the extent to which that instructor teaches computer ethics in his/her class (Question 10a - 10d).

The experience with ethical problems does seem to be related to the instructor's teaching computer ethics in their classes. For example, only 58.3 percent of the instructors who answered 'no' to all parts of question 10, indicating no teaching of computer ethics, said in question 14 that they had experienced or seen others experience ethical problems with computer or information technology. However, 90.3 percent who answered 'yes' to some part of question 10, indicating some teaching of computer ethics, said in question 14 that they had experienced or seen others

experience ethical problems with computer or information technology.

Question 15. This question asked instructors if they had ever been a student in a class or portion of a class devoted to computer ethics. Less than 25 percent of the total respondents had ever been a student in such a class. The data from this question is contained in Tables 16 and 16-1.

Table 16. Student in Class Devoted to
Computer Ethics

	<u>No. of Responses</u>	<u>Percentage</u>
NO	57	76.0
YES	<u>17</u>	<u>22.7</u>
	*74	98.7

*One respondent (1.3%) did not answer question 15.

When the percentages are broken down by teaching location, a larger percentage of instructors who hve been students in classes where computer ethics were taught is at the Air Force Academy. Table 16-1 reflects this.

Table 16-1. Percentage by Teaching Location

	<u>NO</u>	<u>YES</u>
Academy	61.5	38.5
AFIT	92.9	7.1
ATC	67.6	29.4

Eighty-three percent of those respondents who answered 'no' to all parts of question 10, also answered 'no' to

question 15. This percentage is almost equal to the 77.4 percent of respondents who answered some part of question 10 'yes' and 'no' to question 15.

There does not appear to be a relationship between teaching computer ethics and having studied in a class where computer ethics was taught.

Question 16. The instructors were asked to indicate if they had previously instructed a course or portion of a course in computer ethics. Less than 15 percent of the respondents have had prior experience teaching computer ethics. Tables 17 and 17-1 display the frequency distribution for this question.

Table 17. Prior Teaching Experience in
Computer Ethics

	<u>No. of Responses</u>	<u>Percentage</u>
NO	63	84.0
YES	<u>11</u>	<u>14.7</u>
	*74	98.7

*One respondent (1.3%) did not answer question 16.

Table 17-1 shows that again the largest percentage of instructors with experience teaching computer ethics is at the Air Force Academy.

Table 17-1. Percentages by Teaching Location

	<u>NO</u>	<u>YES</u>
Academy	69.2	30.8
AFIT	92.9	7.1
ATC	82.4	14.7

Question 17. This question asked if respondents had conducted research in the area of computer ethics. Table 18 shows the frequency of responses to question 17.

Table 18. Conducted Research in Computer Ethics

	<u>No. of Responses</u>	<u>Percentage</u>
NO	71	94.7
YES	<u>3</u>	<u>4.0</u>
	*74	98.7

*One respondent (1.3%) did not answer question 17.

Question 18. The instructors were asked if they had ever attended the presentation of a paper or a panel discussion on the topic of computer ethics at any professional symposium. Table 19 indicates the data distribution.

Table 19. Attended Paper Presentation/Panel Discussion on Topic of Computer Ethics

	<u>No of Responses</u>	<u>Percentage</u>
NO	68	90.7
YES	<u>6</u>	<u>8.0</u>
	*74	98.7

*One respondent (91.3%) did not answer question 18.

Opinions of Instructors About Teaching Computer Ethics

Questions 19-24 were designed to gather data about the opinions instructors have about teaching computer ethics.

The frequency distributions and general discussion of the data gather from the responses to these questions follow.

Question 19. Instructors were asked if a course in computer ethics should be a required course for students majoring in computer science or information systems. Nearly half of the respondents believe that computer ethics should be a required course for computer science and MIS students. Tables 20 and 20-1 have the frequency distributions for this question.

Table 20. Computer Ethics a Required Course

	<u>No. of Responses</u>	<u>Percentage</u>
NO	31	41.3
YES	<u>37</u>	<u>49.4</u>
	*68	90.7

*Seven respondents (9.3%) did not answer question 19.

As Table 20 illustrates, the opinions, of instructors about requiring a course in computer ethics is split almost equally. However, Table 20-1 illustrates a big difference when percentages are broken down by teaching location. At the ATC school 73.5 percent of the instructors believe the course should be required. In contrast, only 38.5% and 25.0% of the instructors at the Academy and AFIT, respectively, believe a course in computer ethics should be required. Looking at the distribution another way, over two-thirds of the instructors who believe a computer ethics course should be required teach at the ATC school.

The difference in these percentages is possibly related to the varied time length and course restrictions of the 3 programs. For instance, AFIT's degree program is strictly limited to 18 months and 66 courses.

Table 20-1. Percentages by Teaching Location

	<u>NO</u>	<u>YES</u>
Academy	61.5	38.5
AFIT	64.3	25.0
ATC	14.7	73.5

Question 20. Instructors were asked if some other department should teach the course on computer ethics. Tables 21 and 21-1 reflect the instructors' responses.

Table 21. Computer Ethics Should be Taught by Another Department

	<u>No. of Responses</u>	<u>Percentage</u>
NO	31	41.4
YES	<u>29</u>	<u>38.6</u>
	*59	80.0

*Fifteen respondents (20.0%) did not answer question 20.

Of those 37 instructors who stated that a course in computer ethics should be required course, 21 or 56.8 percent also stated that the course would be best taught by the computer science or MIS departments.

As Table 21 illustrates, the instructors' responses divided nearly equally. But like the responses to question

19, when the responses are broken down by teaching location, a difference can be seen. Over 55.9 percent of the instructors at the ATC school believe the course should be taught by the computer or information sciences department. However, only 30.8 percent and 28.5 percent of the instructors at the Academy and AFIT, respectively, believe the course should be taught by the computer or information sciences department. Table 21-1 shows the frequency distribution by teaching location.

Table 21-1. Percentages by Teaching Location

	<u>NO</u>	<u>YES</u>
Academy	30.8	61.5
AFIT	28.5	50.0
ATC	55.9	20.6

Questions 21 - 24 used a Likert scale to measure the respondents' agreement or disagreement with the statements. The Likert scale consists of five possible responses (1 - 5), with 1 indicating total disagreement and 5 indicating total agreement.

Question 21. Instructors were asked to respond to the following statement: "Students should be given classroom instruction about computer ethics." The frequency distribution, mean, and standard deviation for data collected from these responses are included in Table 22.

Table 22. Students Should Be Given Classroom Instruction in Computer Ethics

	<u>No of Responses</u>	<u>Percentage</u>
1 (Disagree)	5	6.7
2	5	6.7
3	18	24.0
4	20	26.6
5 (Agree)	<u>26</u>	<u>34.7</u>
	*74	98.7

Mean: 3.77 Std Deviation: 1.20

*One respondent (1.3%) did not answer question 21.

Fifteen (48.4%) of the 31 instructors who said that computer ethics should not be a required course (question 19) indicated here that they moderately agreed (response 4) or agreed (response 5) that some classroom instruction should be given to students.

Question 22. This question asked the instructors' to respond to the following statement: "Students would respond favorably to a required computer ethics course." Over 50 percent of the instructors felt that students would not respond favorably to a required course in computer ethics. Table 23 contains the frequency distribution, mean, and standard deviation for this data.

Table 23. Students Would Respond Favorably to a Course in Computer Ethics

	<u>No. of Responses</u>	<u>Percentage</u>
1 (Disagree)	16	21.3
2	24	32.0
3	22	29.3
4	5	6.7
5	<u>5</u>	<u>6.7</u>
	72	96.0

Mean: 2.46 Std Deviation: 1.13

*Three respondents (4.0%) did not answer question 22.

Question 23. This question asked the instructors' opinion on the following statement: 'I am interested in teaching a course devoted to computer ethics.' Over half of the respondents (54.7%) disagree or moderately disagree with the statement. Table 24 reflects the frequency distribution, mean, and standard deviation of the data.

Table 24. Interested in Teaching a Course Devoted to Computer Ethics

	<u>No. of Responses</u>	<u>Percentage</u>
1 (Disagree)	27	36.0
2	14	18.7
3	14	18.7
4	12	16.0
5 (Agree)	<u>7</u>	<u>9.3</u>
	*74	98.7

Mean: 2.43
Std Deviation: 1.38

*One respondent (1.3%) did not answer question 23.

Question 24. Instructors were asked to respond to the following statement. "I am qualified to teach an entire course devoted to computer ethics." The frequency distribution, mean, and standard deviation for this data are contained in Table 25.

Table 25. Qualified to Teach a Course Devoted to Computer Ethics

	<u>No. of Responses</u>	<u>Percentage</u>
1 (Disagree)	38	50.7
2	18	24.0
3	13	17.3
4	3	4.0
5 (Agree)	<u>1</u>	<u>1.3</u>
	*73	97.3

Mean: 1.78
Std Deviation: .98

*Two respondents (2.7%) did not answer question 24.

The instructor's opinion of his/her qualification did not seem to affect his/her answers to questions 19 or 20. Both the group who believed themselves qualified and the group who believed themselves unqualified split almost evenly in their responses to requiring a course in computer ethics and which departments should teach the course.

The opinions of those instructors who felt unqualified to teach the course were split almost evenly, on the issues of requiring a course in computer ethics and which departments should teach the course.

Likewise, the opinions of instructors who felt qualified to teach the course were also split evenly on the issues of a required computer ethics course and which department should teach the course.

Using these descriptive statistics, there appears to be no relationship between an instructor's sense of qualification and his/her beliefs about requiring a computer ethics course or which department should teach it.

V. Conclusions and Recommendations

Conclusions

The need for teaching computer ethics to MIS and computer science professionals is growing. MIS and computer science professionals, university instructors, and corporate managers are all trying to formulate ways to meet this need.

To meet the increasing need to teach MIS and computer science professionals better, the literature supports a greater emphasis be placed on computer ethics in university instruction and corporate training programs.

This need to teach computer ethics affects the Air Force. The Air Force is increasing its use and reliance upon computer and information technology. As a result, MIS and computer science professionals are playing a bigger part in fulfilling the Air Force mission.

This study used a questionnaire to learn what Air Force educational/training institutions are doing to meet the need to teach computer ethics to Air Force MIS and computer science professionals. In formulating an answer to this problem, several investigative questions were addressed:

1. What are the specific courses of instruction at Air Force educational/training institutions devoted to computer ethics?

2. Is instruction in computer ethics, at Air Force educational/training institutions, incorporated into MIS and

computer science courses that are not devoted to computer ethics? If so, How?

3. What are the future plans for teaching computer ethics in computer science and information resource courses at Air Force educational/training institutions.

4. How much knowledge and experience do instructors at Air Force educational/training institutions have in teaching computer ethics?

5. What opinions do these instructors have about teaching computer ethics?

Investigative Question One. "What are the specific courses of instruction at Air Force educational/training institutions devoted to computer ethics?"

There are no entire courses being taught at Air Force educational/training institutions that are designed entirely and specifically to be devoted to the topic of computer ethics.

At the ATC school there is one entire module of a 33 module course being devoted to computer ethics.

Also, a portion of a course at AFIT was specifically redesigned recently to teach computer ethics. AMGT 553 was expanded to a 4 credit-hour course to accommodate the need to teach computer ethics to computer science students. There is no course at the Academy specifically designed to meet the need to teach computer ethics to students.

Investigative Question Two. "Is instruction in computer ethics, at Air Force educational/training institutions,

incorporated into MIS and computer science courses that are not devoted to computer ethics?"

At the Academy, there is not a course formally designed (like the module at the ATC school or AMGT 553 at AFIT) to address computer ethics. However, computer ethics appears to be more commonly introduced by the instructors in many of the courses formally designed to teach technical subjects in computer science and engineering. As discussed in chapter 4, a significantly larger percentage of instructors at the Academy, compared to the ATC school and AFIT, incorporate the topic of computer ethics into their courses. In general, instructors at the Academy lecture and discuss computer ethics more in all of their courses. The lecture time and discussion given to computer ethics at the Academy courses cover a broader range of issues too. The fact that the ATC school and AFIT have specifically designed a module and a portion of a course to address computer ethics probably explains this.

Investigative Question Three. "What are the future plans for teaching computer ethics in computer science and information resource courses at Air Force educational/training institutions."

There are no plans at any of the schools to add to the curriculum modules or courses specifically devoted to computer ethics. The plan to redesign AMGT 553 to add computer ethics was accomplished in the summer of 1988 and the course was offered beginning in September 1988.

Several instructors at AFIT plan to incorporate issues in computer ethics into their other MIS and computer science courses. A significantly smaller percentage of instructors at the ATC school and the Academy are making similar plans, probably because of the structured module technique used at the ATC school and because most of the instructors are already incorporating computer ethics into their classes at the Academy.

Investigative Question Four. "How much knowledge and experience do instructors at Air Force educational/training institutions have in teaching computer ethics."

The instructors surveyed seem to have learned about computer ethics primarily through personal experience with ethical problems or seeing others experience ethical problems.

There seems to be a general lack of experience in the instructors' formal education with and teaching of computer ethics. Only a small handful have themselves been a student in a class where computer ethics were taught. Even a smaller number have had prior teaching experience in the subject. Only 3 have conducted any research at all dealing with computer ethics.

Having little preparation and education in computer ethics may account for only one instructor fully agreeing that he/she is qualified to teach an entire course in computer ethics

This lack of preparation and education on the part of the instructors is probably best explained by the sparse attention computer ethics has received throughout the profession as a whole. It simply hasn't been a matter of concern until very recently.

Investigative Question Five. "What opinions do these instructors have about teaching computer ethics?"

In light of the recent importance placed on meeting the ever increasing need to teach computer ethics, the instructors' opinions have a slightly negative tone.

There is no consensus among the instructors even on the usefulness of giving classroom instruction on computer ethics to students or on which department should teach a computer ethics course.

There is certainly no significant interest among the instructors in teaching a course in computer ethics. They also feel that students would respond overwhelmingly and negatively to a required computer ethics course.

The Specific Research Objective. This objective was to determine if Air Force educational/training institutions were teaching computer ethics and if so to what extent.

Computer ethics have been neglected for years by MIS and computer science professionals. The Air Force, like many other organizations, is now beginning to see the necessity of teaching computer ethics to its professionals.

Despite these years of neglect, Air Force educational/training institutions are beginning to emphasize

computer ethics. This emphasis is gaining strength but at this time lacks a certain focus. This is probably because computer ethics have recently received greater attention, but there is still no consensus on its importance and appropriateness to a computer science curriculum. Civilian colleges and universities have been described as feeling their way in implementing instruction in computer ethics. This description is also appropriate for computer ethics instruction at Air Force institutions.

Recommendations for Further Study

1. Computer ethics are beginning to be taught at Air Force educational/training institutions. The effectiveness of the teaching should be studied to determine if the teaching is having a positive affect, and if so, which approaches to teaching work best. An analysis of graduating students' knowledge and opinions about computer ethics could be accomplished. This analysis could be compared to the learning objectives of the department to see if the objectives are being met. The analysis could also be compared with the knowledge and opinions of students educated/trained at civilian institutions.

2. This research studied only the instruction in computer ethics being given to Air Force officers. However, there is a larger population of enlisted members who work with the Air Force's computer and information technology as part of their every day job. A study of enlisted personnel,

presently working with computer or information technology, could be done to determine the extent their knowledge and understanding of computer ethics. The analysis could be used to assess the need to incorporate computer ethics into their technical school and on-the-job training.

Appendix A

Instructions and Survey

AFIT SCHOOL OF SYSTEMS AND LOGISTICS GRADUATE INFORMATION RESOURCE MANAGEMENT PROGRAM SURVEY OF INSTRUCTORS

The purpose of this survey is to gather information from academic/training instructors for thesis research. All responses will be anonymous.

General Instructors

1. Please fill out the survey in the manner most convenient to you (pen, pencil, typed).
2. Most of the questions ask you to simply respond by indicating YES, NO, or a degree on an opinion scale. A few of the questions ask you to comment briefly in the spaces provided.
3. For this survey, computer ethics is defined as "the study of the general nature of morals and of the specific moral choices to be made by the individual in his relationship with others as they pertain to the use of information and computer technology." Computer ethical issues include but are not limited to the following:
 - Fraud, waste, and abuse
 - Right to privacy
 - Ownership of software and intellectual property
 - Right of access to data
 - The responsibility for accuracy
 - Allowing computers to make critical decisions involving the lives of others
 - The impact of computer and information technology on society
 - The ownership of expertise extracted from people and placed in expert systems
4. When you have completed the survey, please put the survey and answer sheet in the envelope provided and send to 1Lt Jeff Nelson, AFIT/LSG, Wright-Patterson AFB, Ohio 45433-6583. Thank you for your participation

COMPUTER ETHICS ACADEMIC SURVEY

Questions 1 - 6 ask for background information. Please circle the letter that corresponds to the correct response.

1. What is your age group?

- a. 20 - 25
- b. 26 - 30
- c. 31 - 35
- d. 36 - 40
- e. 41 or above

2. What is your current rank?

- | | |
|-----------|------------------|
| a. 2nd Lt | g. Up to GS-8 |
| b. 1st Lt | h. GS-9 to GS-11 |
| c. Capt | i. Other |
| d. Maj | |
| e. Lt Col | |
| f. Col | |

3. What is your sex?

- a. Female
- b. Male

4. What is your highest educational level?

- a. Bachelor's degree
- b. Bachelor's degree plus
- c. Master's degree
- d. Master's degree plus
- e. Doctoral degree

5. How many years have you been in your current job?

- a. Less than 1 year
- b. 1 year but less than 2
- c. 2 years but less than 3
- d. 3 years but less than 4
- e. More than 4 years

6. Where are you now teaching?

- a. In an Air Training Command sponsored course
- b. At the Air Force Academy
- c. At the Air Force Institute of Technology

For questions 7 - 20 please circle YES or NO and where appropriate briefly answer in the space provided.

7. Do you teach a course devoted to the topic of computer ethics? YES NO

IF YOUR ANSWER IS 'YES' PLEASE GO TO QUESTION #8.

IF YOUR ANSWER IS 'NO' PLEASE GO TO QUESTION #10.

8. If you do teach a course devoted to the topic of computer ethics, what is its title?

9. If you do teach a course devoted to the topic of computer ethics,

a. when did you begin teaching the course?
(month)(year)

b. do you plan to continue teaching the course?
YES NO

c. what (if any) were the obstacles associated with beginning and organizing the course?

NOW, PLEASE GO TO QUESTION #13.

10. If you do not teach a course devoted to the topic of computer ethics...

a. is any portion of another course that you teach specifically devoted to teaching computer ethics?
YES NO

b. do you spend any portion of your lecture time and material on the topic of computer ethics? YES NO

c. is the topic of computer ethics or any specific ethical situation ever discussed with or among the students in your classes? YES NO

d. do you include, in any of your class reading lists, bibliographies, or other associated materials any books or articles pertaining to computer ethics? YES NO

11. If you answered "YES" to any part of question #10, briefly explain what issues or topics are discussed? How much time is devoted to these issues?

12. If you do not teach a course devoted to the topic of computer ethics,

a. do you have any plans to teach a course on computer ethics in the future? YES NO

b. do you have any plans to incorporate the topic of computer ethics in your other courses in any way?
YES NO

13. Professional codes of ethics and conduct for computer professionals and data processors have been developed by the Association of Computing Machinery and the Institute for Certification of Computer Professionals. Do you, in any way, attempt to familiarize your students with these or any other professional code? YES NO If YES in what way?

14. Have you ever seen/experienced ethical problems involving computer or information technology? YES NO

15. Have you ever been a student in a class or portion of a class devoted to computer ethics? YES NO

16. Have you ever before taught a class or portion of a class devoted to computer ethics? YES NO

17. Have you conducted any research in the area of computer ethics? YES NO

18. Have you ever attended the presentation of a paper or a panel discussion on the topic of computer ethics at any professional symposium? YES NO

19. Should a course in computer ethics be a required course for students majoring in computer science or information systems? YES NO

20. Would a course in computer ethics be better taught by the philosophy or other academic department? YES NO

For questions 21 - 24, please circle the number on the scale that best reflects your response to the statement.

21. Students should be given classroom instruction about computer ethics.

1 2 3 4 5
Disagree.....Agree

22. Students would respond favorably to a required computer ethics course.

1 2 3 4 5
Disagree.....Agree

23. I am interested in teaching a course devoted to computer ethics.

1 2 3 4 5
Disagree.....Agree

24. I am qualified to teach an entire course devoted to computer ethics.

1 2 3 4 5
Disagree.....Agree

THIS CONCLUDES THE SURVEY. THANK YOU FOR YOUR TIME AND EFFORT. PLEASE PUT THIS SURVEY INTO THE PRE-ADDRESSED ENVELOPE AND PLACE IT IN THE DISTRIBUTION SYSTEM.

Appendix B

Question #11 Written Responses

Responses from the ATC Courses

"Software transfer"

"Copying software"

"Sharing of copyright software without paying for it"

"Vendor rights are mentioned during discussion of AFR 700-3. The students are responsible for protecting copyright software"

"Fraud, waste, and abuse. Rights of ownership of software, etc....accuracy, responsibilities of programmers"

"Fraud, waste, and abuse. Right to privacy, ownership of software and intellectual property, right of access to data, responsibility for accuracy, allowing computers to make critical decisions involving lives of others the impact of computer and information technology on society"

"Fraud, waste, and abuse. Some on software copyright laws and some on registering systems that use a students' SSAN for ID purposes"

"In relation to fraud, waste and abuse, how using massive prints for non-productive reasons is a waste of resources"

"Situations usually come up when discussing personal computers"

"Privacy Act and its effects"

"Privacy and Freedom of Information laws, AFR 12-30 and 12-35"

"Software copyrights. Software is the property of the government don't take it home or misuse it on the job"

Responses from AFIT

"Students discuss shareware"

"Informed discussion about software available for AFIT related work"

"Accuracy of data, privacy, fraud, waste, and abuse, rights of access"

"At this point, purely ad hoc discussions in software engineering course"

"Ethics in systems design and performance evaluation"

"Software piracy, etc..."

"The impropriety of pirating software"

"Some issues of privacy and the impact of it on society come up in the database and data communications courses"

Responses from the Air Force Academy

"Impact on society, privacy, ownership of software"

"Violation of software licensing agreements"

"All of the areas are discussed. A lesson is devoted to the impact on society"

"Briefly mention copyright laws (especially pertaining to non-copy protected software"

"Privacy, Freedom of Information Act, software piracy and ownership, societal implications of software, and responsibility for accuracy of developed software products"

"Copying of copyrighted software and honor code implications"

Bibliography

1. Abshire, Gary M. "The Ethical Insensitivity of Computer Specialists and What You Can Do About It," Computers and Society, 12: 10-11 (Winter 1982).
2. Adair, James H. and James L. Linderman. "Computer Ethics and Academic Honesty: Developing a Survey Instrument," ACM SIGCSE Bulletin, 17: 93-95 (March 1985).
3. Aiken, Robert M. "Reflections on Teaching Computer Ethics," ACM SIGCSE Bulletin, 15: 8-12 (September 1983).
4. The American Heritage Dictionary of the English Language. Boston: American Heritage Publishing Co., Inc., 1975.
5. Bequai, August. "Lack of Ethics as a Cause of Computer Crime," Computers and People, 33: 7-14, 24 (May-June 1984).
6. Bloombecker, Jay. "Computer Security for the People," Computers and Society, 14: 12-15 (Winter-Spring-Summer-Fall 1985).
7. Bloombecker, J.J. "Computer Ethics: An Antidote to Despair," Computers and Society, 16: 3-11 (Winter-Spring 1987).
8. Bologna, Jack. "The Ethics of Managing Information," Journal of Systems Management, 30: 28-30 (August 1987).
9. Buss, Martin D.J. and Lynn M. Salerno. "Common Sense and Computer Security," Harvard Business Review, 62: 112-121 (March-April 1984).
10. Colby, Kenneth Mark. "Reloading a Human Memory: A New Ethical Question for Artificial Intelligence Technology," AI Magazine, 6: 63-64 (Winter 1986).
11. Cook, Janet M. "What C.S. Graduates Don't Learn about Security Concepts and Ethical Standards," ACM SIGCSE Bulletin, 18: 89-95 (February 1986).
12. DeLoughry, Thomas J. "Failure of Colleges to Teach Computer Ethics Is Called Oversight With Potentially Catastrophic Consequences," The Chronicle of Higher Education, 34: A15, A18 (24 February 1988).
13. Heide, Dorothy and James K. Hightower. "Organizations, Ethics and the Computing Professional," Journal of Systems Management, 34: 38-42 (November 1983).

14. Immel Richard A. "Computer Ethics," Popular Computing, 3: 65-68 (June 1984).
15. Laver, Murray. Computers and Social Change. London: Cambridge University Press, 1980.
16. Mason, Richard O. and Carr P. Collins. "Four Ethical Issues of the Information Age," MIS Quarterly, 10: 4-12 (March 1986).
17. Parker, Donn B. Ethical Conflicts in Computer Science and Technology. Menlo Park CA: AFIPS Press, 1981.
18. Sankar, Y. "Organizational Culture and New Technologies," Journal of Systems Management, 39: 10-17 (April 1988).
19. Sardinas, Joseph L. et al. "Data Processing: Towards a Social Responsibility," Journal of Systems Management 37: 14-19 (May 1986).
20. Toffler, Alvin. The Third Wave. Toronto: William Morrow and Co., Inc. 1980.
21. Turn, Rein. "Courses on Societal Impacts of Computers," Computers and Society, 13 and 14: 14-16 (Winter, Spring, Summer, Fall 1984).
22. Weiss, Eric A. "Self-Assessment Procedure IX," Communications of the ACM, 25: 181-195 (March 1982).

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Abstract

This research studied the instruction being given to information management and computer science students at the Air Force Academy, Air Force Institute of Technology, and appropriate training courses offered at schools operated by the Air Training Command. The specific purpose of the study was to determine the extent to which computer ethics are being taught to information management and computer science students through this instruction. To accomplish this, instructors at the above mentioned schools were surveyed to determine what instruction in computer ethics is being given, any plans for future instruction in computer ethics, and the instructors' experience with and opinions about teaching computer ethics.

The results indicate that computer ethics are beginning to be emphasized by the education/training programs and instructors. This emphasis is gaining strength but at this time lacks a certain focus. This is probably because computer ethics have received greater attention recently, but there is still no consensus on its importance and appropriateness to a computer science curriculum. Civilian colleges and universities have been described as feeling their way in implementing instruction in computer ethics. This description is also appropriate for computer ethics instruction at Air Force institutions. *Keywords:*

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